1512964940

VIM PROMOVET INSITAM

UNIVERSITY OF BRISTOL

MEDICAL
LIBRARY

Restr. Med 18

SHELF

D.A.

Digitized by the Internet Archive
in 2015

https://archive.org/details/b21442186

4

A

METHOD

OF

Preventing or diminiſhing Pain

IN

SEVERAL OPERATIONS

OF

SURGERY.

By JAMES MOORE,
Member of the SURGEONS COMPANY of LONDON.

LONDON:
PRINTED FOR T. CADELL, IN THE STRAND.
MDCCLXXXIV.

[Price Two Shillings.]

2.-/c

TO

JOHN GUNNING, Eſq.
JOHN HUNTER, Eſq.
Surgeons in Extraordinary to His Majeſty;

CHARLES HAWKINS, Eſq.
Surgeon to His Majeſty's Houſhold;

AND TO

WILLIAM WALKER, Eſq.

SURGEONS TO St. GEORGE's HOSPITAL.

GENTLEMEN,

HAVING had the advantage of being a Pupil, and afterwards Houſe-Surgeon, of the Hoſpital, where your profeſſional talents are exerciſed; I beg leave to addreſs the following Eſſay to You, from whoſe practice I formed my earlieſt ideas in Surgery, as a ſmall mark of the reſpect with which I am,

Gentlemen,

Your moſt obedient,

And moſt humble Servant,

Clifford-Street,
November 20, 1784.

JAMES MOORE.

A METHOD OF Preventing or diminiſhing Pain, in ſeveral Operations of SURGERY.

IF any of the profeſſions were, in a particular manner, to be diſtinguiſhed by the name of humane; we might naturally expect it would be that whoſe particular object it is, to relieve the ſufferings of humanity. And, if a greater degree of compaſſion and ſympathy were looked for among one claſs of men than any other, we ſhould expect to find it in the breaſts of thoſe who paſs their lives in the duties of ſo benevolent a profeſſion.

Phyſicians, however, have been accuſed of a want of feeling for the diſtreſſes of human nature, and ſurgeons of actual cruelty.

If this accuſation were juſt, it would ſtrike with more force at the arts of medicine and ſurgery themſelves, than at the individuals who profeſs them. For it is impoſſible to imagine, that men of cruel diſpoſitions would be attracted more than others to the ſtudy of arts, whoſe aim is the alleviation and removal of ſickneſs and pain. It muſt therefore be the exerciſe of thoſe arts, which renders phyſicians and ſurgeons unfeeling and cruel, and not an original unfeeling and cruel diſpoſition that directed them in their choice of thoſe arts.

If this could be made out, it would deter not only men of benevolent diſpoſitions, but even men of common humanity, from engaging in ſuch profeſſions. For the natural wiſh of the truly benevolent is, to cheriſh and cultivate, within their own breaſts, every ſentiment and feeling of humanity. No conſideration would prevail on them; indeed, what conſideration could prevail on any of the human race, to adopt profeſſions, whoſe natural tendency is to eradicate the feelings of a man, and plant in their boſoms thoſe of a demon?

No accuſation of this nature, however, is well founded, againſt any branch of the healing art; but what leads the undiſcerning into miſtake on this head is, that, happily for mankind, the habit of ſeeing objects of diſtreſs, without diminiſhing the ſentiments of compaſſion in the breaſts of the humane, enables them to preſerve that compoſure and preſence of mind, which is often neceſſary for giving effectual relief; and which, thoſe to whom diſtreſſed objects are leſs familiar, are exceedingly apt to loſe.

Indeed, if the above accuſation were well founded, it would go to prove, that thoſe people in general, whatever their particular profeſſions may be, who make it a duty to viſit priſons and hoſpitals, and ſearch in the cells of poverty for proper objects for the exerciſe of compaſſion and charity, gradually become hard-hearted; while genuine ſenſibility dwells only in the breaſts of thoſe who fly from ſcenes of miſery, ſhut their ears againſt the cry of anguiſh, and, at the accidental ſight of every object of wretchedneſs, ſhow no emotions but thoſe of horror and diſguſt. This, however, is ſo contrary to experience, and every obſervation on the human character, that it is not worth the trouble of a refutation.

The art of medicine has this advantage over the art of ſurgery, that the means it uſes to accompliſh its ends are leſs painful; but ſurgery, on the other hand, has this ſuperiority over medicine, that it is more certain.

As the accuſation of cruelty is more directly pointed againſt ſurgery, I ſhall confine myſelf, in what I have farther to ſay, to that branch of the healing art. Surely cruelty cannot with juſtice be imputed to an art which preſerves the lives of many; and, by tranſient and temporary pains, ſaves many more from years of torture.

That ſome ſurgeons are cruel, cannot be denied; and the reaſon is, becauſe all men are not humane. But nothing can be more abſurd than the opinion entertained by ſome people, that a certain degree of cruelty is requiſite to enable a man to perform ſurgical operations with coolneſs and preſence of mind. This is ſaying, in other words, that to render a man expert in the moſt eſſential acts of humanity, it is neceſſary he ſhould be inhumane. No;—it is neceſſary he ſhould be a good anatomiſt, and thoroughly maſter of his buſineſs as a ſurgeon; it is neceſſary that he be convinced the patient has no other chance for life and eaſe; and then a man of common ſteadineſs and the greateſt humanity will ſucceſsfully perform every operation of ſurgery, and continue the practice through life, without any diminution of his humanity.

If inſtances are brought of men who are conſidered as good ſurgeons, and yet are of a cruel or unfeeling diſpoſition, it would be very eaſy to prove, that they would be better ſurgeons if they were men of humanity. For one aim of ſurgery being to ſave pain, a humane man is much more likely to take every meaſure for this purpoſe than a cruel one. All pain that is not abſolutely neceſſary for the well-performing the operation, adds to the danger of the patient, for pain alone is one cauſe of fever. But it is not only during the operation, but at every previous and ſubſequent dreſſing, that an unfeeling ſurgeon will be apt to give the patient unneceſſary pain, which a ſurgeon of humanity will always attentively avoid.

It is ſaid, that the unfeeling ſurgeon will perform the operation as eaſily and expeditiouſly as he can for the ſake of his own reputation; and when he has occaſion to dreſs the wound, he will, on the ſame account, affect a tenderneſs which he does not poſſeſs. But it ought to be remembered, that people are continually forgetting their aſſumed, and ſliding into their natural characters. Nothing therefore can be more certain, than that humanity of diſpoſition, when joined to knowledge and ſteadineſs, tend to render a ſurgeon not only more agreeable, but more ſucceſsful in his practice.

As ſurgery is in reality one of the moſt humane, ſo, from its nature, it muſt have been one of the moſt ancient of the arts. The art of curing internal and external diſeaſes was exerciſed by the ſame men in the early ages. The ſame benevolent diſpoſition prompted to the one and the other. But it is natural to think, that, from the temperance of mankind in thoſe times, they would have few internal diſeaſes, while the cultivation of the earth, and other neceſſary labours muſt have expoſed them to external injuries. Theſe laſt being viſible, would naturally attract their attention ſooner, and make a ſtronger impreſſion on their minds, than hidden diſeaſes could do.

It is probable, therefore, that ſurgery is the moſt ancient of the two branches of the healing art. When a bruiſe or hurt of any kind was received, the pain would directly excite the ſufferer to movements and contortions of the injured part; but he would ſoon perceive that this augmented his anguiſh; and the firſt diſcovery in ſurgery probably was, that it is proper to keep a wounded limb quiet and without motion.

It would be obſerved likewiſe, that cold increaſed the pain of a wound or bruiſe, which would ſuggeſt the idea of covering them. The firſt coverings would probably be the leaves of herbs and plants. When theſe became hard and uneaſy, they would be removed, and freſh ones applied. In the courſe of which treatment it would frequently happen, that the injured part would recover, and the leaves would get the credit of the cure. In this manner various plants, which contribute nothing to the healing of wounds, got the name of vulneraries, and afterwards became ingredients in plaſters and ointments.

Thus it ſeems probable, that the earlieſt efforts of ſurgery had no object beyond that of palliating or relieving pain. But, as the art improved, and new diſeaſes occurred, cures of the greateſt importance were undertaken. Plants of all kinds were tried, and the whole vegetable kingdom ranſacked for external applications that would eaſe pain, and heal wounds.

But when fighting and war began, many caſes muſt have occurred, in which the applications of herbs could not give relief. Other aids muſt then have been invented, particularly cutting inſtruments; for without them, what excruciating pain muſt have been endured before a forked-arrow could be extracted from the fleſh! with what facility can it be removed, by enlarging the wound with a cutting inſtrument! The very enlargement of the wound muſt have been remarked in many caſes to have haſtened the cure, which would give the firſt hint for the ſame practice in ſinuſes and other caſes, although no dart or arrow was to be cut out.

The ſpeedy relief given, and the acute pain ſaved to the wounded by ſuch means, would of courſe prompt men to invent new inſtruments of different forms, adapted to the relief of that variety of accidents and diſorders to which they are expoſed. When the danger was great and immediate, ſome means very painful in the application were adopted. We know that not only cutting inſtruments, but even the actual cautery, was uſed in ſurgery in the days of Hippocrates—and continued to a very late period, as the only means of ſtopping violent hæmorrhages, and removing ſome very obſtinate complaints; but the diſcovery of the circulation of the blood, and a juſter notion of diſeaſes, have long ſince introduced leſs painful methods of ſtopping bleedings, and relieving thoſe diſeaſes. Nothing leſs than to ſave the patient from immediate death, or to relieve him from exceſſive and durable pain, could juſtify the having recourſe to ſo ſevere a cure as the cautery; and it is to the honour of ſurgery to have thrown it aſide, as ſoon as an eaſier one was invented. The actual cautery is now never employed but to occaſion the exfoliation of diſeaſed bones, where there is no ſenſibility.

The ſame deſire of ſaving pain to their patients has induced modern ſurgeons to reject the uſe of the ſciſſars, which formerly were much uſed for the opening of ſinuſes, and performing other operations. In thoſe days, the opportunities of ſtudying anatomy were few, and an accurate knowledge of that ſcience was by no means univerſal among practitioners. Conſcious of this deficiency, they very naturally were afraid of uſing the ſcalpel, leſt they ſhould divide ſome large artery, or injure ſome nerve or tendon. The feelings of the patient therefore were ſacrificed to his ſafety, and an inſtrument that bruiſes as well as cuts was preferred, becauſe it only touches thoſe parts which are contained between the blades.

But of late years anatomy has been cultivated ſo diligently all over Europe, and has been taught in this iſland in particular with ſuch accuracy, that the ſciſſars are entirely left off by ſurgeons, except in the operation for the hare lip ; and the biſtory or ſcalpel, inſtruments which give much leſs pain, and in ſkilful hands are equally ſafe, have been univerſally adopted in their ſtead.

In performing the operation for the ſtone, ſome ſurgeons formerly uſed dilating inſtruments, which, though they greatly augmented the pain, were thought to diminiſh the danger. Male and female conductors, and other inſtruments, intended to render this operation leſs dangerous, were alſo at different periods introduced ; but in this iſland they have all been ſuperſeded in favour of Sir Cæſar Hawkins's admirable invention of the cutting gorget, which unites eaſe with ſafety.

But after every improvement that can be made on the inſtruments of ſurgery, and on the manner of operating, ſtill a great degree of pain attends that diviſion or extenſion of the fibres of the human body, which is requiſite in ſurgical operations. An obvious means of lulling and diminiſhing this was early tried by giving the patient anodynes internally, ſome time before he underwent an operation. Opium is the moſt powerful of this claſs of drugs, and a moderate doſe is highly expedient to abate the ſmarting of the wound after an operation is over, and to induce ſleep; but the ſtrongeſt doſe we dare venture to give, has little or no effect in mitigating the ſufferings of the patient during the operation.

The moſt eſſential improvements that can be made in ſurgery are unqueſtionably thoſe which render operations ſafer, and diminiſh the danger of the patient's life. But what can diminiſh the acuteneſs of the pain without increaſing the danger, is alſo an improvement very much to be wiſhed. Some people ſay, what ſignifies a few minutes pain;—but it is not thoſe who think themſelves under the immediate neceſſity of undergoing a ſurgical operation who are apt to hold ſuch language.

The common uneaſy ſenſation which is included in the general term of pain, is indeed of little conſequence. But when people conſider the degree of pain given by ſome ſurgical operations, they muſt acknowledge, that to diminiſh or prevent a few minutes of *ſuch* pain, is an object highly deſirable, both to the patient and ſurgeon. Reflections of this kind ſtruck me very early after I began to ſtudy my profeſſion, and I made various experiments without ſucceſs, in ſearch of ſomething which might mitigate the violence of the pain in ſurgical operations. Of late I reſumed the ſubject, and reflecting on the nature of the nerves, and on ſome facts concerning them, I was led to an idea, which I flatter myſelf, will go a conſiderable way to the accompliſhing the object I had in view.

It is known, that the nerves, which ariſe from the brain, and are diſperſed to all parts of the body, are the immediate organs of feeling and voluntary motion. For when the trunk of a nerve, whoſe branches are diſperſed to any particular part, is cut or tied, the part to which thoſe branches go, immediately loſes feeling and voluntary motion. The firſt thought that occurred to me was, that, to cut the trunk of a nerve going to a limb, might be done with little pain, and enable us to perform the amputation with no pain at all. But a very little reflection convinced me that this was impracticable. For, ſuppoſe the amputation of the leg, below the knee, is to be performed; cutting the nerves immediately above the part where the inciſion is to be made, would not be ſufficient; becauſe the ſkin and fleſh below the knee, receive ſenſation from branches thrown off much higher up. To render the inſenſibility complete, it would be neceſſary to cut the two great nerves at the top of the thigh, ſoon after they iſſue out of the pelvis. But one of them, the crural nerve, runs in contact with the crural artery and vein; and the other, the ſciatic nerve, runs extremely deep among the muſcles, which would render their diviſion at once painful and dangerous.

In an amputation of the arm, the objection to cutting the nerves is ſtill ſtronger; for the artery below the arm-pit is entangled with a plexus of nerves, which it would be impoſſible to cut without dividing the artery alſo.

I then thought my end might poſſibly be accompliſhed by compreſſion; and was encouraged in this idea, by having often felt that ſenſation, which, I ſuppoſe, every body has felt ſome time or other, when we ſay the leg is ſleeping; and which entirely proceeds from compreſſing the ſciatic nerve by ſitting in a particular poſition. In that ſtate, the leg and foot are numbed, and rendered in ſome meaſure inſenſible, and, at the ſame time, our power of moving them is greatly impaired. It is not till after we have ſtood up, or varied our poſture, ſo as to remove the compreſſion for a conſiderable time, that the ſenſibility and power of motion perfectly return. I recollected alſo the experiment which has been ſo often made on living animals, of putting a ligature around the nerve going to a particular limb, which renders all the parts below the ligature inſenſible.

It occurred to me, at the ſame time, that the compreſſion of the nerve might be made much more effectually by means of the tourniquet, than by any poſture in which we could poſſibly ſit, and I determined to try the experiment on myſelf.

For this purpoſe I placed a compreſs directly over the ſciatic nerve, juſt as it paſſes over the inferior edge of the iſchium, fixed it with a bandage acroſs the pelvis, between the ſpine of the ilium and the great trochanter, and then applying the tourniquet, I tightened it as much as I could bear. But, to my ſurpriſe, and great mortification, my leg and foot retained their feeling as much as ever.

As it had always ſeemed evident to me, that the ſleeping of the foot, as it is termed, was owing to a preſſure of the ſciatic nerve, it now appeared unaccountable that the preſſure I had juſt made, did not produce that ſenſation. It ſtruck me, however, that although I had turned the tourniquet very hard, yet I might poſſibly not have made a ſufficiently ſtrong preſſure directly on the ſciatic nerve, from my compreſs being too thin.

I cauſed a thicker and larger compreſs to be made, applied it accurately over the nerve as before, and I tightened the tourniquet ſo as to make a far ſtronger preſſure upon the nerve than any which could be made by the weight of the body in ſitting. But ſtill my limb retained its ſenſibility, and I felt no ſenſation like that of the foot's ſleeping.

I ſlackened the tourniquet and removed the whole apparatus, aſtoniſhed and perplexed at an event ſo little to be expected!

How did it happen that ſo ſtrong a compreſſion did not produce the ſame effect with a ligature?

How did it happen, that it did not at leaſt produce a numbneſs and ſleeping in the leg, which a ſmaller preſſure did?

Thinking frequently on this ſubject, I recollected that this ſenſation does not take place *immediately* on the preſſure of the nerve in ſitting; it is neceſſary to ſit for a conſiderable time before it is felt. This being the only eſſential circumſtance in which the preſſure made by the compreſs and tourniquet, differed from the preſſure by ſitting, I immediately ſuſpected that the failure of the firſt in producing the ſame effect with the ſecond, depended on this alone; I therefore reſolved to renew the experiment, and continue the compreſſion as long as I thought I could with ſafety.

I immediately put this reſolution in execution. After the compreſſion had been continued about fourteen minutes, I felt a tingling in my toes ſimilar to what is felt when the foot begins to ſleep; ſoon after, my toes grew quite numbed; this numbneſs gradually ſpread up my leg and thigh, and in half an hour, my foot, leg, and the outſide of my thigh, were perfectly inſenſible; ſo that when I pricked or ſcratched them with pins, I felt nothing. I alſo loſt the power of moving my foot; but although I kept up the compreſſion for ſome time longer, part of the *inſide* of my thigh and leg ſtill retained ſome degree of feeling. I recollected that this muſt be owing to my not having compreſſed the crural nerve, which paſſes under Paupert's ligament, with the crural artery and vein, and the obturator nerve, which paſſes through the obturator ligament.

I ſlackened the tourniquet, in great hopes that my next experiment would intirely anſwer my expectations. Senſation, and the power of motion, gradually returned to my limb, a few minutes after I had looſened the tourniquet.

Being now convinced that to deprive the whole limb of feeling, it would be neceſſary to compreſs the crural and obturator nerves, as well as the ſciatic, a circumſtance I had neglected in the laſt trial, I determined to renew the experiment in that manner. I perceived, however, with ſome concern, that this could not be done without compreſſing the crural artery and vein likewiſe, and conſequently ſtopping the circulation of blood in the limb.

But this conſideration did not prevent my making the experiment ſoon after. I cauſed a bandage to be made with two thick compreſſes, one of which was placed on the crural and obturator nerves, and the other on the ſciatic, at the upper part of the thigh. The tourniquet was applied and tightened. The tingling in my toes, followed by inſenſibility and loſs of motion, took place in about the ſame time as in the laſt experiment. And in half an hour, the inſenſibility, which gradually ſpread itſelf upwards, was complete; and I had not the leaſt feeling upon pricking or ſcratching any part of the limb.

I now ſent for Dr. Moore, my father, and for the firſt time informed him of the experiments I had made; he alſo tried the effect of pricking my leg with a pin without occaſioning the ſmalleſt uneaſineſs; but perceiving my leg red and diſtended, and being afraid a blood veſſel might burſt, he unloofened the tourniquet, without allowing it to remain ſo long as in the laſt experiment.

There is an uneaſy ſenſation produced by the compreſſion, but how infinitely inferior this is to the pain of amputations, may be conceived from my bearing it eaſily for ſo long a period. From thoſe trials I had little doubt, but that by effectually compreſſing the nerves for a proper time, the whole, or by far the greateſt part of the pain in amputations, and ſome other ſurgical operations, may be ſaved to the patient.

Repeated experiments have proved, that cutting or tying a nerve going to a part inſtantly deſtroys ſenſation, and voluntary motion in that part. Cutting quite through certainly deſtroys the texture of the nerve; and I have a ſtrong ſuſpicion, that when the ligature is made ſo tight as *inſtantly* to ſtop ſenſation in the parts below, tying it in that manner deſtroys its texture alſo.

But compreſſion does not injure the nerve ſo much, as either cutting, or ſuch tying. And to this circumſtance perhaps it is owing that it requires ſome time before compreſſion produces that degree of inſenſibility which is inſtantly the effect of the other two methods. Be that as it may, it certainly does require a certain time before the inſenſibility follows the greateſt compreſſion. This has never before been obſerved, or applied to the purpoſe of preventing the pain in ſurgical operations.

The idea that a certain fluid, which has been diſtinguiſhed by the name of animal ſpirits, flows in the nerves, and that it is by the means of this fluid, and its free egreſs and regreſs to and from the brain, that motion and ſenſibility depend, has been adopted by phyſiologiſts of the greateſt eminence. Yet as this fluid has never been made evident to the ſenſes, but has baffled the reſearches of the moſt dexterous anatomiſts, its exiſtence can be conſidered as no more than a mere hypotheſis, and of courſe it is poſſible that no ſuch fluid does exiſt. On the ſuppoſition of ſuch a fluid, it might naturally be expected, that upon compreſſing the nerves in the manner above deſcribed, the numbneſs and loſs of voluntary motion of the parts below the compreſſion would take place inſtantly; whereas, we find, that they happen in a very gradual manner, and are not complete till after a conſiderable time. Which ſeems rather to favour the ſuſpicion many entertain, that no ſuch fluid as the animal ſpirits does exiſt, but that the brain and nerves perform their functions by ſome other means, which nobody has ever yet been able to diſcover or explain. But however that may be, is of little importance to our preſent purpoſe; I return therefore to my ſubject.

The firſt notion I had with reſpect to the manner of rendering the limb inſenſible previous to amputation, was no other than that which I uſed when I made the compreſſion on my own thigh; to place compreſſes of a proper thickneſs upon the ſciatic, crural, and obturator nerves, to apply and twiſt the tourniquet, and keep it ſo, till the limb loſes all ſenſation. But as the total ſtoppage of the circulation for ſo long a time as is neceſſary to render the limb completely inſenſible, will be conſidered as an objection, I thought of an inſtrument which will in a great meaſure obviate this, by effectually compreſſing the nerves, without entirely ſtopping the circulation of the blood in the limb. I gave directions to Mr. Savigny in Pallmall, for making the inſtrument, which I find entirely anſwers the purpoſe intended.

A clear idea of the compreſſor, and the manner it is to be applied, will be conceived from the annexed plate.

Figure I. A, the compreſſing inſtrument, being formed of a curved piece of

iron,

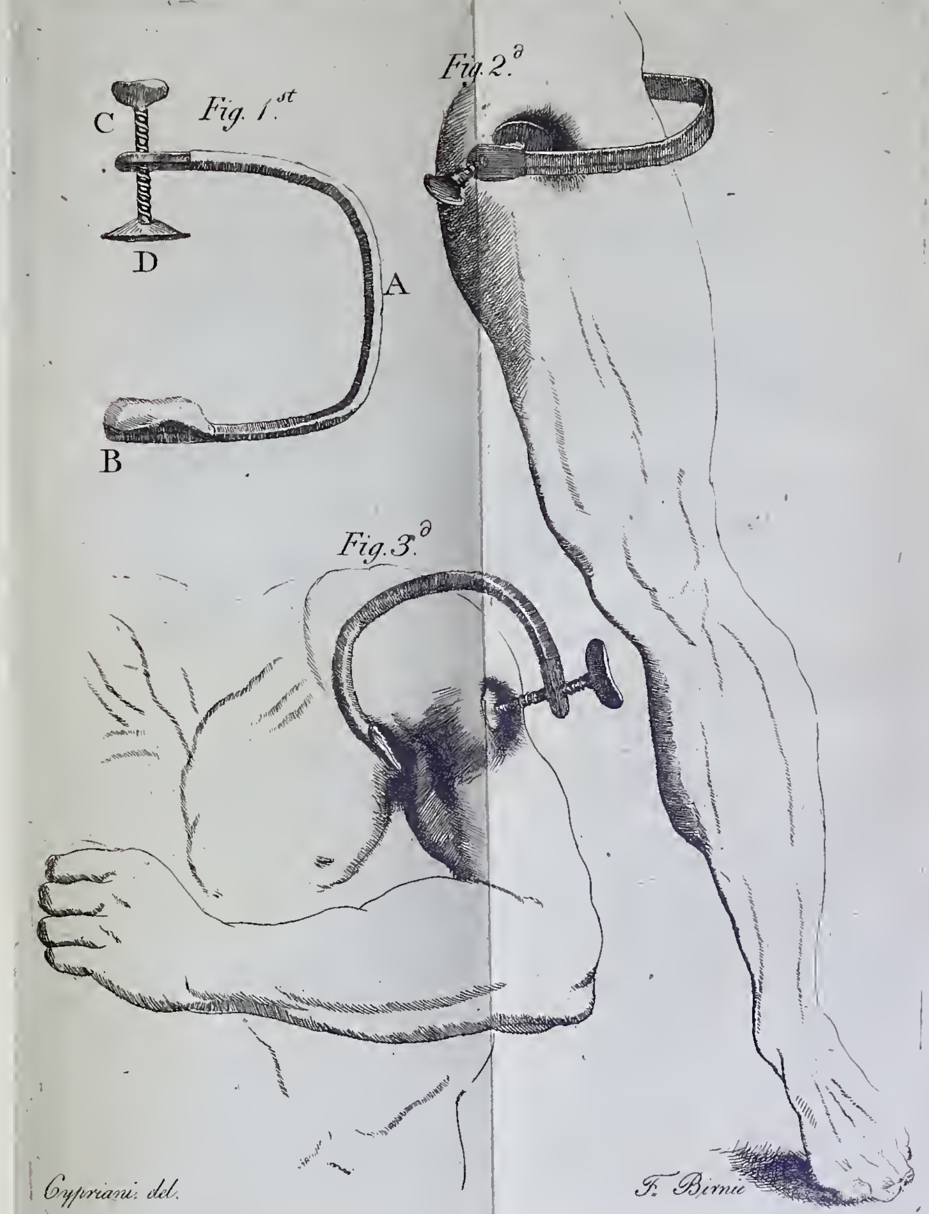
iron, covered with leather, and of ſufficient capacity to contain the thigh within its curve.

B, a firm compreſs of leather, at one extremity of the inſtrument, which is to be placed on the ſciatic nerve.

C, a ſcrew paſſing through a hole at the other extremity of the inſtrument, and terminating in D, an oval compreſs to be placed on the crural nerve.

When this inſtrument is to be applied, it will be neceſſary in the firſt place to ſearch for the ſciatic nerve. For this purpoſe, let the operator feel for the tuberoſity of the os iſchium, and then for the great trochanter, and ſuppoſing a ſtraight line drawn from the one to the other, apply the compreſs B about an inch above the middle of that line.

The crural nerve is found by the pulſation of the crural artery which runs contiguous to it. The oval compreſs D muſt



Cypriani. del.

F. Birnie

next be applied above it, and upon turning the ſkrew C, the ſciatic nerve is preſſed by B againſt the edge of the ſciatic notch, and the crural nerve againſt the os femoris, to any degree that is neceſſary.

Figure II. repreſents the inſtrument adjuſted to the thigh. And Figure III. a ſmaller compreſſor, ſuited to the arm.

As all the nerves, which give ſenſation to the arm, form a plexus in the axilla, cloſe to the humeral artery, the pulſation of the latter will direct the operator where to place the compreſſor.

Although we are under an abſolute neceſſity of compreſſing the crural artery along with the nerve, there is not the ſame neceſſity of compreſſing the crural vein; becauſe the latter is the moſt internal of the three. So that, with attention, the compreſs may be kept ſo much towards the outſide of the thigh, as to bear upon the nerve without touching the vein.

It is evident, that by this inſtrument the compreſſion is confined to two points, which are nearly oppoſite to each other. All the reſt of the limb is left free and uncompreſſed.

We cannot apprehend any bad conſequence from the ſtopping the great artery for an hour or two; for we know that, after the operation for the aneuriſm in the thigh where the artery is tied, and the circulation through it ſtopped for ever, yet the anaſtamoſing veſſels carry on a circulation ſufficient for the nouriſhment of the limb.

This, however, will render it neceſſary, in all amputations where the compreſſor is adopted, to apply the common tourniquet in the uſual manner. For without this precaution, although the great artery is obſtructed, ſtill the bleeding would be very profuſe from the anaſtamoſing veſſels.

As ſoon as the inſtrument was made, I tried it on my own thigh. After continuing the compreſſion half an hour, I loſt all ſenſation and power of motion below the knee; but the thigh retained a conſiderable degree of feeling. This is owing to ſome branches of the lumbar nerves, to the obturator nerve, and branches which the ſciatic and crural ſend off before they deſcend to the thigh, not being compreſſed by this inſtrument. From which it is evident, that the compreſſor will not be able to diminiſh the pain in amputations above the knee, in ſuch a degree as below.

I ſpoke on the ſubject to ſome gentlemen of the faculty, who ſeemed equally pleaſed and ſurpriſed at the effect of the experiments I had made, and thought they ought to be publiſhed, as the ſpeedieſt way of aſcertaining ſo intereſting a fact.

Being perfectly convinced myſelf that the pain of many operations in ſurgery would be prevented, or at leaſt diminiſhed, by the means I propoſed; I was ſufficiently inclined not to delay their publication.

Yet, as my experiments had been of ſo confined a nature, I wiſhed that the compreſſor might be tried in ſome ſevere operation, previous to their being made public.

I communicated the experiments I had made, and all my ideas on the ſubject, to Mr. Hunter, who was ſo obliging as immediately to offer me an opportunity of trying the effect of my compreſſor at St. George's Hoſpital, on a man whoſe leg he was to take off below the knee within a few days.

I went to the hoſpital the day before the operation to try the inſtrument. The patient had loſt all his toes, and had a large ulcer on his foot. This was ſo much inflamed, and ſo irritable, that dreſſing it in the gentleſt manner gave him acute pain.

I applied the inſtrument; after the compreſſion had been continued for about half an hour, his limb became ſo inſenſible that rubbing pretty ſmartly with the finger upon the ulcer gave no pain.

Next morning the patient being carried to the operation room, I began the compreſſion of the nerves at a quarter before eleven o'clock. The numbneſs of the limb followed at the uſual time.

At a quarter before twelve, I gave him one grain of opium, to diminiſh the ſmarting of the wound after the operation, when the compreſſion ſhould be taken off. A few minutes after twelve, the tourniquet was applied, and the amputation performed by Mr. Hunter, at the uſual place below the knee.

At the circular inciſion through the ſkin, the patient did not cry out, change a muſcle of his face, or ſhew any ſymptom of pain. At the ſubſequent parts of the operation, particularly during the ſawing of the bones, he ſhewed marks of uneaſineſs in his countenance, but did not cry out.

As it was thought neceſſary to take up no leſs than five arteries, the operation laſted a longer time than is uſual, and towards the end he grew faintiſh, and deſired to have ſome water, and afterwards aſked if they were nearly done.

When the operation ſeemed to be over, and the bleeding ſtopt, the tourniquet was relaxed, and I alſo removed the compreſſor. But a ſmall veſſel bleeding unexpectedly, it was thought neceſſary to tie it alſo. Here the patient ſhewed very ſtrong marks of pain, and afterwards declared, the tying this laſt veſſel gave him much more pain than all the others, although the great nerves had been included in the ligatures.

When he was put to bed, the wound ſmarted, as is uſual after amputations. The compreſſor being now entirely removed, this was to be expected. But ſome time after being queſtioned concerning the pain he had ſuffered during the operation, he declared that he had felt hardly any, except as he himſelf expreſſed it, at the raſping of the bones, which he added had ſhaken his whole limb. This ſeems a little extraordinary, as ſawing the bones is uſually the leaſt painful part of amputations.

Although I expected that the anaſtamoſing veſſels would carry on a certain degree of circulation notwithſtanding the obſtruction of the great trunk, yet I had no idea that it would have been ſo ſtrong as it was; for, on ſlackening the tourniquet, the arteries bled per ſaltum, though the compreſſing inſtrument remained in full force on the crural artery.

This trial had all the ſucceſs I expected; there was evidently a moſt remarkable diminution of pain, particularly during the firſt inciſions through the ſkin and muſcles, which are generally by far the moſt ſevere parts of the operation. And I am convinced that what pain the patient felt, was chiefly owing to ſome ſmall branches of the lumbar nerves which extend below the knee, and were not compreſſed.

I gave directions for a ſmaller compreſſor to be made for the arm. The inſtrument may be applied with greater facility, and will probably have a more complete effect in preventing pain in amputations and other operations of this member than in thoſe of the thigh and leg, becauſe all the nerves which convey ſenſation to the arm and hand, lie together in the axilla. The inſtrument therefore being applied as in Figure III. will compreſs the whole plexus at once.

The artery, indeed, which is ſurrounded with this plexus of nerves will be compreſſed alſo. But the circulation here, as in the leg, will be ſufficiently carried on by the anaſtamoſing veſſels. I tried the ſmaller compreſſor on my own arm, and the inſenſibility followed in rather a ſhorter time than happens in compreſſing the nerves of the thigh.

In amputations where the compreſſor is uſed, it will be proper to apply it at leaſt an hour and an half before the operation. The uneaſineſs which this occaſions is ſo ſmall as hardly to deſerve mention.

It was thought by ſome of the gentlemen to whom I communicated my ideas on this ſubject, that it would be neceſſary to looſen the compreſſor after the limb is taken off, and, previous to the tying of the veſſels, that the ſurgeon might the more diſtinctly ſee thoſe that need to be tied; by which means ſenſation would return to the parts, and of courſe there would be the uſual pain in tying the veſſels. But a ſurgeon, who is an anatomiſt, eaſily finds the great arteries without even the tourniquet's being ſlackened, which is neceſſary only for diſcovering the ſmaller arteries, and the free manner in which they bled as ſoon as the tourniquet was ſlackened in the operation above deſcribed, obviates this objection, by proving, that there is no neceſſity for removing the compreſſion of the nerves, till every part of the operation is finiſhed.

It has already been obſerved, that the compreſſor for the thigh acts only upon the ſciatic and crural nerves, and can have no effect upon thoſe branches of the lumbar nerves, which come off from within the pelvis, ſome of which deſcend below the knee. But perhaps, applying the common tourniquet, and keeping it tight for a quarter of an hour, or twenty minutes, before the operation, would ſupply this defect, and blunt, in ſome degree, the ſenſibility thoſe branches produce in amputations immediately below the knee. This, however, is an object of little importance, as when the great trunks of the ſciatic and crural nerves have been duly compreſſed for a proper time, the degree of ſenſibility which the twigs abovementioned convey, cannot be great.

On removing the compreſſor after amputations, the patient will no doubt be expoſed to the ſame degree of ſmarting from the wound, that is uſual when the operation has been performed in the common way. All I originally expected from the compreſſing inſtrument was, a prevention or great diminution of pain during operations. But I have ſince entertained a notion, that even the ſmarting of the wound after amputations of the leg would be greatly leſſened, by applying the termination of the compreſſor B * upon the ſciatic nerve, and mak-

---

* Vide Fig. I. of the Plate.

ing the oval compreſs D bear on ſome other part than that where the crural artery vein and nerve are; by which means the circulation of the blood through the leg and thigh will not be impeded, yet the ſciatic nerve will be ſo compreſſed as may reduce the ſmarting to a ſenſation eaſily to be endured. But, as I have made no experiment to aſcertain this, I hazard it merely as a conjecture.

It may be urged, that compreſſing the large trunks of nerves, and thereby obſtructing the nervous influence for ſo long a time, may leave a numbneſs, or ſome paralytic weakneſs in that part of the limb which remains. I cannot think, however, that there is the leaſt danger of any ſuch conſequence. I have frequently kept the compreſſor upon my own limbs for a conſiderable time after all ſenſibility and power of motion was gone; and a few minutes after removing it, both returned as entirely as before. The ſame has taken place with reſpect to the patient at St. George's hoſpital, whoſe leg was amputated.

When by a blow on the head, part of the ſkull is beat down and preſſes on the brain; or when from the ſame, or any other accident, extravaſated blood is lodged between the ſkull and brain, and preſſes upon the latter ſo as to occaſion a ſtupor and inſenſibility; though the preſſure here is not made on one nerve, but on the origin of *all* the nerves, ſo as to produce *univerſal* inſenſibility; yet, as ſoon as the depreſſion is removed, or the extravaſation evacuated, or abſorbed, ſenſation returns. This is what every ſurgeon muſt have had occaſion to ſee frequently. But I am perſwaded that, in a ſhort time, experience will prove better than any reaſoning *a priori*, or from analogy, that this objection has no weight.

It may be proper here to obſerve, that all the nerves which go to the thigh, that cannot be compreſſed by the inſtrument, are,

1ſt, The obturator, whoſe branches are extended on the thigh, and do not reach below the knee.

2d, One or two ſmall branches, which the crural nerve ſends off higher up than the inſtrument can be fixed, and which are alſo expanded on the thigh, without reaching below the knee.

3d, Some branches of the lumbar nerves, without names, which are ſpread on the thigh, and do extend below the knee.

From this account it is evident, that the compreſſing inſtrument cannot diminiſh the ſenſation in the thigh in ſuch a complete manner as in the leg.

In amputations above the knee, therefore, it will be neceſſary to uſe the common tourniquet in the following manner:

Two thick compreſſes are to be placed upon the great nerves, immediately above where the bone is to be ſawed. Then the tourniquet muſt be applied over them, tightened, and kept in that ſituation till the thigh becomes inſenſible.

It is impoſſible to ſay, before the trial is made, what length of time it will require to render the inſenſibility complete; but I imagine that, after an hour, very little pain will be ſuffered from the operation. When the veins become turgid, it will perhaps be right to open one with a lancet, leſt any of them ſhould burſt. No danger need be apprehended from the loſs of blood this will occaſion; becauſe the tourniquet will prevent any from flowing, that would not at any rate have been loſt on the firſt inciſion.

The circulation is never entirely ſtopt by the tourniquet, ſo that there will be no danger of any bad conſequence, from its being continued tight the time neceſſary for preventing, or greatly diminiſhing, the pain of the operation. Whatever happens to the part of the limb that is to be cut off, is of no conſequence.

As the keeping the tourniquet tight upon the thigh for ſo long a time, though attended with no danger, muſt give more uneaſineſs than the compreſſor; it is to be regretted that the inſenſibility cannot be entirely accompliſhed by the laſt inſtrument as at preſent conſtructed. A more commodious and effectual method may probably occur to ſome other perſon; and particular improvements will, no doubt, be adapted to particular caſes. Mean while, all the inconveniences ariſing from the uſe of the tourniquet as a compreſſor in the manner above deſcribed, will be more than compenſated by the abatement of pain it will produce.

The ſtrongeſt objection made to the ingenious manner of amputating limbs, invented by Mr. Allanſon of Liverpool, is, that it takes up longer time than the common method, and of courſe keeps the patient longer in torment. The improvement I have propoſed will, particularly in amputations below the knee, and in the arm, remove the whole ſpirit of this objection, and the full benefit of that gentleman's invention will be enjoyed without inconveniency.

A particular treatment, like that uſed at Paris, might poſſibly favour the union by the firſt intention.

Previous to Lithotomy, amputations, and all ſurgical operations of importance, except ſuch as from the nature of the caſe require to be performed inſtantly, or where the perſon is already much weakened, it is the practice at Paris, and, I believe, all over France, to make the patient undergo what is called a preparatory courſe; which is proportioned to the perſon's ſtrength, and the ſeverity of the operation to be performed, and generally laſts ten days or a fortnight.

If the patient is of a plethoric habit, he is blooded; the reſt of the courſe conſiſts of a few doſes of gentle purgatives, a warm bath every ſecond or third day, and a low cooling regimen.

The principal effect expected from this courſe, is to prevent the violence of the ſymptomatic fever; and, as far as I could judge, it had that effect.

We often obſerve that weak people, and thoſe who are debilitated by a diſeaſe of long ſtanding, recover better after operations, than thoſe who are more plethoric and robuſt.—This ſeems to be an argument for the above practice; and I am inclined to think, that a ſimilar courſe might be adopted with peculiar propriety before amputations performed in Mr. Allanſon's manner; becauſe, I believe, ſuch previous treatment would favour his great object of curing the wound by the firſt intention.

But preventing pain in amputations, is not the only benefit which will ariſe from compreſſing the nerves. I flatter myſelf, many other advantages will attend it. By deadening the ſenſibility of the parts to be operated upon, the ſurgeon will be enabled to examine bones that are ſuſpected to be carious, to uſe the means neceſſary to produce exfoliations, to lay open abſceſſes and ſinuſes, to remove ſplinters and other extraneous ſubſtances from wounds and ulcers, and of courſe cure them with more certainty and expedition than formerly.

For the patient being enabled to bear the probing, enlarging, and every requiſite mode of examination with more tranquillity, the ſurgeon of courſe muſt acquire a more certain and extenſive knowledge of the nature of each caſe, than when his inveſtigations are diſturbed by the cries and contortions of the ſufferer; and therefore we may reaſonably hope, that not only pain, but even limbs and lives may ſometimes be ſaved.

The reduction of fractures and diſlocations will alſo be rendered more eaſy to the ſurgeon as well as the patient. For although the muſcles, when irritated by extenſion or otherwiſe, may ſtill contract a little, yet the compreſſion of the nerves will prevent the patient's having either the power or inclination to reſiſt the efforts of the operator, for reſtoring the parts to their natural ſituation.

The dreadful idea many people have, of the pain attending ſurgical operations, has often of itſelf the very worſt effects.

The previous knowledge, therefore, that by this method his pain will be greatly mitigated, will contribute to prevent all that agitation of mind and feveriſhneſs which ſo violent an impreſſion occaſions; and of courſe render every ſurgical operation, in which compreſſion of the nerves can be uſed, leſs dangerous.

It is not impoſſible, but that the locked jaw, when that dreadful ſymptom ariſes from a wound in any of the extremities, may be cured by compreſſing the nerve between the injured part and the brain.

Some people may imagine, that I ought to have delayed this publication till the effects of compreſſing the nerves could be fully aſcertained, by a number and variety of experiments; but it is principally becauſe I think a number and variety of experiments neceſſary, that I have ventured to lay all my ideas on the ſubject, crude as they are, before the Public, without any farther delay; in which I am confirmed by what has happened ſince the operation.

It cannot be imagined, that I conſider the few experiments I have had it in my power to make, or the ſingle trial at St. George's hoſpital, as deciſive; but I flatter myſelf they are ſufficient to excite a very thorough inveſtigation; and I am convinced, that whatever farther trials I or my friends could make, would be objected to, as leſs ſatisfactory, than thoſe which will be made by impartial men of the profeſſion all over the kingdom.

I have therefore related what firſt led me to the idea that pain would be prevented or diminiſhed by a continued compreſſion of the nerves; I have ſtated the experiments I made on myſelf, and their effects; all I can know at this moment with certainty is, that compreſſion deprived my own limbs, in a very great degree, of ſenſibility and motion, without leaving any inconveniency after the compreſſion was removed.

From this I concluded, that it would greatly diminiſh, if not intirely prevent, the pain in ſeveral ſurgical operations;

tions; but to what degree this concluſion is juſt, I cannot poſſibly know with equal certainty. I could only relate the patient's behaviour and aſſertions who underwent amputation at St. George's hoſpital, leaving to every one to give what weight to thoſe he pleaſes. My own full conviction is, that the compreſſion of the nerves in this caſe produced a very great diminution of the pain he would otherwiſe have ſuffered.

Whether by keeping the compreſſor tight for a longer ſpace of time, or by the additional aid of the tourniquet, the pain in ſuch ſevere operations can be entirely prevented, or to what degree it may be diminiſhed, will require various trials and accurate inveſtigation to aſcertain; for this may vary in different operations, and perhaps in different conſtitutions.

Some people poſſeſs ſuch firmneſs of mind, as to deſpiſe a conſiderable degree of pain, and call it nothing; others are of ſo delicate and timid a nature, as to cry out with a moderate uneaſineſs; and there are who could not refrain from crying at the ſight or touch of a ſurgical inſtrument, although there was no pain at all. An operator may, on a particular occaſion, not place the compreſs exactly on the nerves, or may not keep up the preſſure the proper time. From thoſe, and other circumſtances, there may be different accounts, at firſt, of the effects of the method I have propoſed, but the truth will be fully known at laſt; and no plan that might have been followed, could have aſcertained it ſo ſoon, and ſo unexceptionably, as that I have taken.

I already mentioned, that I was adviſed to give the patient at the hoſpital a grain of opium, with a view to mitigate the ſmarting after the operation, and promote ſleep. This practice, I believe, is not uncommon; I have always thought it had a good effect; and therefore am of opinion, it ought to be obſerved, previous to every ſevere operation.

A gentleman of candour and integrity, eminent in his profeſſion, and who honours me with his friendſhip, ſometime after the operation, informed me, that this circumſtance has been laid hold of, and I have ſince learnt from others, that very uncandid conſtructions have been put upon it. This might have given me ſome uneaſineſs, if the malice of thoſe inſinuations were not entirely defeated by their abſurdity. Thoſe whoſe underſtandings allow them to believe that a grain of opium could diminiſh the pain of cutting off a limb, will hardly be convinced of the contrary by *reaſoning*. All I ſhall ſay to ſuch people is, that if I have diſcovered that a grain of opium has ſo great an effect, they muſt at leaſt allow me the merit of being the firſt diſcoverer.

But every body of common ſenſe muſt ſee, that the method I have ſubmitted to the Public, does not admit of impoſition; its real merit or futility muſt be known; it will not long be in the power of detraction to ſtifle the one, nor of friendſhip to conceal the other.

To attempt impoſition, and at the ſame time to publiſh the means of detection, would be a degree of folly without example; but without ſuch abſurdity, a man may wiſh to publiſh what he believes will be of public utility, and may think, that even the probability of ſaving ſevere torture to ſome of his fellow-creatures, a ſtronger reaſon for doing ſo immediately, than the riſk of offering a defective performance to the Public is for delaying it.

THE END.

BOOKS printed for T. CADELL, in the Strand.

DOMESTIC Medicine; or, a Treatiſe on the Prevention and Cure of Diſeaſes, by Regimen and Simple Medicine. By *William Buchan*, M. D. of the Royal College of Phyſicians, *Edinburgh*. A new Edition. 7s. 6d.

⁂ This Treatiſe comprehends not only the Acute, but alſo the Chronic Diſeaſes; and both are teated at much greater Length than in any Performance of the like Nature. It likewiſe contains an Eſſay on the Nurſing and Management of Children; with Rules for preſerving Health, ſuited to the different Situations and Occupations of Mankind. And Directions for the Cure of Wounds, the Reduction of Fractures, Diſlocations, &c.

Experiments on the Human Bile, and Reflections on the Biliary Secretions. With an Introductory Eſſay. By *James Maclurg*, M. D. 4s.

The Chirurgical Works of *Percival Pott*, F. R. S. and Surgeon to St. *Bartholomew*'s Hoſpital. 3 vols. 1l. 1s.

Chirurgical Obſervations and Caſes. By *William Bromfield*, Surgeon to Her Majeſty, and to St. *George*'s Hoſpital. 2 vols. illuſtrated with Plates.

Obſervations on the Duties and Offices of a Phyſician, and on the Method of proſecuting Enquiries in Philoſophy. By Dr. *Gregory*. 5s.

Medical Obſervations and Enquiries, by a Society of Phyſicians in *London*. 5 vols. 1l. 11s.

⁂ The 3d, 4th, and 5th vols. may be had ſeparate.

Medical Eſſays. By a Society at *Edinburgh*. A new Edition. 6 vols. 12mo. 1l. 1s.

Obſervations on the Diſeaſes of the Army, in Camp and Garriſon. In three Parts. With an Appendix, containing ſome Papers of Experiments, read at ſeveral Meetings of the Royal Society. By Sir *John Pringle*, Bart. M. D. F. R. S. A new Edition, corrected, with Additions. 6s.

DIRECTIONS to the BINDER.

Place the Plate fronting Page 26.